SUMMARY OF COMMON PROGRAMS

Overview

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan to restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. The Program addresses problems in four resource areas: ecosystem quality, water quality, levee system integrity, and water supply reliability. Programs to address problems in these four resource areas are designed and integrated to fulfill the CALFED mission.

The CALFED Bay-Delta Program has developed three alternative descriptions for evaluation in Phase II of the Program. The alternatives represent a broad range of potential solutions to problems in the Bay-Delta system. The foundation of each alternative is a set of four common programs that remain relatively constant between alternatives.
Each of the three alternatives also includes a variety of potential combinations of modifications for water conveyance and for storage.

While the basic composition of the common programs remains relatively constant in each alternative, they may perform somewhat differently depending on the storage and conveyance components included within a specific alternative formulation. For example, the water quality common program focuses each alternative on source control and reducing the level of water quality parameters of concern before they enter the Bay-Delta system. Storage proposals in various alternatives may provide additional opportunity to manage flow and diversion timing to the benefit of water quality to a greater or lesser degree than in other alternatives.

Each common program was designed with potential linkages in mind so they each contribute in multiple ways toward achieving Program goals and a comprehensive solution to Bay-Delta problems including ecosystem quality, water quality, levee system vulnerability, and water supply reliability. The intent has been to make the total greater than the sum of it's parts. A discussion on linkage is provided in another section of this document (Integration of Program Elements).

Detailed descriptions of the common programs are provided in (Ecosystem Restoration Program Plan Volumnes I, II and III; Water Quality Program Component Report dated August 1997; Water Use Program Appendix C to Phase II Alternative Descriptions dated May 1997; and Delta Long-Term Levee System Protection Plan Draft dated October 1997).

DESCRIPTION OF COMMON PROGRAMS

Ecosystem Restoration Program Plan

Overview

The goal for ecosystem quality is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. The CALFED Ecosystem Restoration Program Plan (ERPP) addresses this goal. The foundation of the ERPP is restoration of ecological processes that are

associated with streamflow, stream channels, watersheds, and floodplains. These processes create and maintain habitats essential to the life history of species dependent on the Delta. In addition, the Program aims to reduce the effects of stressors that inhibit ecological processes, habitats, and species.

The ecological hub of the Central Valley is the Sacramento-San Joaquin Delta and Bay. The ERPP signals a fundamental shift in the way ecological resources of the Central Valley will be managed. For many decades, government entities, non-profit organizations, and the private sector have engaged in managing, protecting, regulating, and in some cases breeding fish and wildlife species of the Bay and Delta - yet many populations have not recovered sufficiently and remain in decline. In spite of constant human intervention to repopulate fish and wildlife that have commercial, recreational, and biological importance to society (e.g., hatchery programs and expensive re-engineered water diversions), populations have not been sustained at stable, healthy levels that support historic utilization of those resources or would eliminate the need for significantly constraining water management in the system.

Historic efforts at individual species regulation and management will be replaced by an integrated systems approach that aims to reverse the fundamental causes of decline in fish and wildlife populations. A systems approach will recognize the natural forces that created historic habitats and use these forces to help regenerate habitats. The Bay-Delta ecosystem is not simply a list of species. Rather, it is a complex living system sustained by innumerable interactions that are physical, climatic, chemical, and biological in nature, both within and outside of the geographic boundaries of the Delta. The central theme of the ERPP is the recognition that truly durable and resilient populations of valuable fish and wildlife and endangered species inhabiting the Bay and Delta require, above all else, the rehabilitation of ecological processes throughout the Central Valley river and estuary systems and watersheds.

The ERPP is fundamentally different from many past efforts in another way as well. It is not designed as mitigation for projects to improve water supply reliability or to bolster the integrity of Delta levees; improving ecological processes and increasing the amount and quality of habitat are co-equal with other program goals related to water supply reliability, water quality, and levee system integrity, and is considered an integral component of each of those efforts, not merely an extra add-on. Solving serious and long-standing problems in each of these resource areas will require an ambitious, integrated, long-term program.

The ERPP, like all components of Bay-Delta solution alternatives, is being developed and evaluated at a programmatic level. The complex and comprehensive nature of a Bay-Delta solution means that it will necessarily be composed of many different programs, projects, and actions that will be implemented over time. During the current phase of the Program, solution alternatives will be evaluated as sets of programs and projects so that broad benefits and impacts can be identified. In the next phase of the Program, more focused analysis, environmental documentation, and implementation of specific programs and actions will occur.

The CALFED goal for ecosystem quality will be achieved by developing implementation objectives, targets, and programmatic actions that can be implemented to restore ecological

processes. The restoration of these processes is intended to restore and maintain habitats, and to provide for the needs of the species dependent on a healthy Bay-Delta system. For example, restoring stream channels contributes to sediments, nutrients, and a variety of habitats. The strategy recognizes that not all processes can or should be completely restored and that intervention, manipulation, and management will be required. For example, streambed gravel may have to be introduced, habitats may have to be constructed, and vegetation planted. Still, an important part of the approach is to recommend measures that in the long-term will limit the need for continued human intervention.

Implementation of the ERPP is further guided by the recognition that all landscape units and physical and biological components of the ecosystem are interdependent and dynamic. Interdependence means that actions and stressors in one part of the system can and do affect populations and conditions that may be separated by hundreds of miles (e.g., in watersheds and spawning tributaries), or affect the food web in ways that may not be felt for several years.

Dynamic refers to the exposure of natural systems to constant cycles of change in response to both human and natural factors. Most habitats undergo expansions and contractions, or shifts in space and time. The dynamic nature of healthy habitats is the cause of much biological diversity, and complex habitats tend to make species populations more resilient to change. If the mosaic of habitats distributed across a broad landscape is complex, and if large areas of habitat are connected by smaller patches and corridors such as those associated with riparian systems, then healthy areas of the ecosystem can be relied upon to sustain species during temporary setbacks in other areas.

Ecological Zones

Within the Study Area, the ERPP has identified 14 Ecological Zones where the majority of restoration actions will occur. The Ecological Zones are characterized by a predominant physical habitat type and species assemblage. The other regions within the Study Area, the upper watershed areas above major dams, the South San Francisco Bay watershed, and the nearshore Pacific Ocean, are addressed at a programmatic level.

The list of ecological zones follows:

- Sacramento-San Joaquin Delta
- Suisun Marsh/North San Francisco Bay
- Sacramento River
- North Sacramento Valley
- Cottonwood Creek
- Colusa Basin
- Butte Basin
- Feather River/Sutter Basin
- American River
- Yolo Basin
- Eastside Delta Tributaries
- San Joaquin River

- East San Joaquin Basin
- West San Joaquin Basin

A tiered approach has been used to develop ecosystem restoration targets and actions within the ERPP Study Area. The geographic regions within the ERPP Study Area receive varying levels of specificity and emphasis depending on the ability of actions to directly affect problems in the Delta. This approach of tiering actions is an attempt to effectively address problems that are manifest in the Delta problem scope; the ERPP will not address every ecological problem in the Bay-Delta ecosystem. Tiered emphasis does not reflect a priority setting scheme, rather it clarifies the CALFED responsibility to restore ecological health of the Delta and displays where and the degree to which actions need to be implemented. The tiering is an assessment of the number and types of actions identified in the ERPP that need to be implemented to restore ecological health.

The following describes the tiering of the level of actions among the five geographic regions designated within the solution scope of the ERPP.

Sacramento-San Joaquin Delta

The legally defined Delta is comprised of all four Ecological Units of the Sacramento-San Joaquin Delta Ecological Zone and the Suisun Bay and Marsh Ecological unit of the Suisun Marsh/North San Francisco Bay Ecological Zone. The approach in the legally defined Delta differs from the approach in the remainder of the Ecological Zones and Units in the two following ways:

- Extensive focus on habitat including targets and programmatic actions.

- Inclusion of targets for listed species which may have a broad distribution in the ERPP study area but are manifest in the Delta as a "problem."

Sacramento and San Joaquin Rivers, Tributary Watersheds, and Suisun and North San Francisco Bays

The CALFED approach for the Ecological Zones and Units outside the legally defined Delta is to restore important ecological processes, habitats, and species to address problems manifest in the Delta. Generally, the species list is confined to fish species, and the habitat is predominantly riparian and riverine aquatic.

Upper Watersheds

CALFED is supportive of watershed restoration programs and efforts within the upper watersheds which result in measurable benefits to the Delta. The ERPP has developed general targets and programmatic actions for the upper watersheds which are designed to promote and complement local watershed planning and management efforts. (Note: Watershed management is also included in the CALFED Water Quality Common Program.)

Central and South San Francisco Bay Watershed

CALFED supports watershed restoration programs and efforts within the Central-South San Francisco Bay area. South Bay programs and projects in which CALFED would participate must be closely linked to alleviation of problems that are manifest in the Delta as a problem. To date, we have not identified the required linkage. The ERPP has not developed targets or programmatic actions for this area.

Nearshore Pacific Ocean

The nearshore Pacific Ocean is included in the solution area. The ERPP has not developed targets or programmatic actions that directly address habitat conditions in the ocean. The ERPP has developed targets and programmatic actions to encourage improved harvest management and regulations.

Implementation Strategy

A large and diverse ecosystem like the Bay-Delta is extremely complex. There are many processes and relationships at work in the ecosystem that are not fully understood. Thus, there are many difficulties and uncertainties associated with a program to improve ecosystem health. In some cases, problems are well understood and the steps to improvement are clear. In other cases, there is some understanding of the reasons for decline but this understanding is not sufficient to warrant full-scale implementation of remedial measures. In still other cases, additional research is needed before solutions can be identified with certainty.

The difficulties and uncertainties of ecosystem restoration call for an implementation strategy that is flexible and can accommodate and respond to new information. The foundation of the ERPP implementation strategy is **adaptive management**.

Adaptive management is a process of testing alternative ways of meeting objectives, and adapting future management actions according to what has been learned. Adaptive management relies upon the identification of indicators of ecosystem health, comprehensive monitoring of indicators to measure improvement over time, focused research, and phasing of actions.

Indicators are features or attributes of the ecosystem that are expected to change over time in response to implementation of the ERPP. Indicators are selected to provide measurable evaluations of important ecological processes, habitats, and species whose status individually and cumulatively provide an assessment of ecological health. Indicators of ecosystem health are the gauges we will use to measure progress. Some indicators are very broad in scale while others are very specific. For example, a very broad or landscape level indicator of ecosystem health might be a comparison of the total area of riparian forest to historic coverage or an evaluation of the average distance between patches of such forest with closer distances indicating better health than more distant patches. A more specific indicator might be the concentration of toxic substances in the flesh of adult striped bass.

Comprehensive monitoring is the process of measuring the abundance, distribution, change or status of indicators. For example, contaminant concentrations in fish tissues can be measured at various locations and times in the system to determine if contaminant levels are changing. This will allow progress to be measured, allow actions to be modified if necessary, and provide

assurance that the restoration objectives are being achieved.

Focused research will help answer questions about the system and its components and increase the certainty surrounding the relationships of ecological processes, habitats, and species. For example, the relationships among streamflow, storm events, flow-related shaping of river channels to modify habitat, and the physical and chemical signals that flow provides for aquatic species all need to be better understood for effective management of the system.

Phasing is the logical sequence of implementing restoration actions to achieve CALFED goals as effectively as possible. Phasing will consider all targets and programmatic actions and will be used to prioritize actions. For example, actions directed at recovering endangered species which are consistent with the long-term restoration program and contribute to ecological resilience have a high priority. Early phases of the program will include restoration of ecological processes and habitats that are most important for endangered species recovery, reduction of stressors that affect threatened and endangered species, and other actions that may reduce conflicts between beneficial uses in the system. As restoration progresses and threats to endangered species are reduced or eliminated, restoration efforts can expand and focus on the broader issue of restoring ecological health.

Refinement and Implementation
The ERPP will be refined and implemented according to the steps listed below.

1. **Refine** the ERPP based on broad public participation, and using the best scientific knowledge currently available in the short term.

2. **Set the priority** for implementation and funding of ecosystem recovery projects based on a hierarchy designed to ensure the greatest level of overall ecosystem resilience against future disturbance, and to support self-sustaining populations that require the least amount of human intervention possible.

3. **Conduct immediate focused research** to improve understanding of the ecosystem and the causes of identified problems. Use results from short-term studies to adjust the way that objectives are achieved, making refinements to the final ERPP targets, actions, and implementation schedule.

4. **Develop and begin a phased implement-ation** program that entails:

    - short-term implementation of ecosystem restoration demonstration projects (e.g., through Category III and related programs), including stressor reduction measures, to help threatened populations begin recovering and to test the viability and effectiveness of targets and actions,

    - coordinated monitoring, evaluation, and reporting of the results of recovery efforts, and the status of ecological indicators in the Bay-Delta and other zones, and

- adaptive management of each successive phase of ERPP implementation, including pragmatic adjustments to ecosystem targets, funding priorities, and restoration techniques to ensure that public and private resources are well spent and complement other related efforts.

During refinement and implementation of the ERPP, public accountability and program effectiveness will be assured through agency coordination, continuing public involvement, and necessary environmental impact analysis and documentation.

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Water Quality Program

Introduction

CALFED's objective for water quality is to provide good water quality for urban, agricultural, industrial, environmental, and recreational beneficial uses. This objective will be achieved through development and implementation of the CALFED Water Quality Program (WQP). The WQP will recommend action strategies that address identified parameters of concern to beneficial uses. These action strategies will have measurable performance targets and indicators of success that will be used to judge program effectiveness and facilitate adaptive management.

The Water Quality Program includes:

- beneficial use water quality issues,
- water quality parameters of concern to beneficial uses,
- sources and loadings of parameters of concern,
- water quality beneficial use problem areas,
- existing programs to address parameters of concern,
- CALFED recommended action strategies,
- a monitoring and assessment framework to and evaluate action effectiveness, and
- a description of how CALFED's water quality activities may be coordinated with ongoing watershed management activities.

Impacts To Beneficial Uses of Water

Drinking Water

The Delta is a source of drinking water for about 20 million, or two-thirds, of all Californians. Beneficial use of drinking water can be impacted by loadings of bromide, nutrients, salinity, organic carbon, turbidity, pathogens or changes in pH. Pathogens such as *Cryptosporidium parvum* in source water can adversely affect municipal drinking water supplies. Nutrient loading, and subsequent algae blooms, can impair the taste and odor of municipal water supplies and increase the expense of treating the water. Elevated turbidity due to suspended solids can be responsible for increasing treatment costs for municipal water supplies.

A major problem during periods of low Delta outflows is tidal mixing of salt into the Delta channels. Salts are a major concern with regard to municipal drinking water supplies because of the presence in sea water of bromide, which contributes to unwanted disinfection byproducts (DBPs). Salt can result in aesthetic problems such as salty taste, corrosion of appliances, plumbing and industrial facilities, and reduced opportunity for waste water recycling. Salts also are present in freshwater inflows to the Delta due to municipal and agricultural discharges. The most heavily concentrated sources of agricultural drainage to the Delta is the San Joaquin River.

Organic carbon in source water can adversely affect municipal drinking water supplies by combining with water treatment disinfectants to produce harmful by-products such as trihalomethanes. Of particular concern to drinking water is agricultural drainage from Delta Islands because the peat soils of the Delta contribute organic carbon to the agricultural drainage

water. Delta diversions through the State Water Project H.O. Banks and North Bay Pumping Plants, the Central Valley Project Tracy Pumping Plant, and the Contra Costa Water District Pumping Plant at Rock Slough supply water for municipal purposes. Figure E-1 depicts the interaction between municipal water intakes located in the Delta and sources of bromides, salinity and organic carbon.

Agriculture

More than 1,800 agricultural diversions are located within the Delta. These diversions supply irrigation water to over 450,000 acres of fertile Delta farmlands. Irrigation water destined for use on millions of acres in the San Joaquin Valley and Southern California is also diverted in the Delta at the same intakes used for municipal water diversion. Beneficial uses of water by agriculture can be impacted by loadings of boron, salts, nutrients, pH, sodium absorption ratios, and turbidity. Excess salts can result in plant toxicity and negative effects on plant growth and crop yield.. Salts affect the ability of a plant to take up water. Salts coupled with a disproportionate amount of sodium in the water, can cause the soil surface to seal, limiting water infiltration. Excessive vegetative growth or delayed crop maturity can result from excessive nutrients and white deposits on fruit or leaves can occur due to sprinkling with high pH water. Turbidity and nutrients can also foul irrigation systems.

Environment

The Delta is the West Coast's largest estuary, one of the country's largest systems for fish production, and provides habitat for more than 120 fish species. An estimated 25 percent of all warm water and anadromous sport fishing species and 80 percent of the state's commercial fishery species either live in or migrate through the Delta. Beneficial uses of water for environmental purposes, specifically fishery resources, have been impacted due to toxic pollutants such as trace metals and synthetic organic compounds. Also, nutrients, pathogens, pH, dissolved oxygen and temperature have the potential to affect Delta species. Populations of striped bass and other species have declined significantly from historical levels. Causes of the declines are uncertain, although water quality conditions in the Bay and Delta, decreases in Delta inflow and outflow rates, habitat loss, agricultural and other instream diversions, and in-Delta exports are thought to be contributing factors. Metals, pesticides, salts, and ammonia in elevated concentrations can be toxic to early life stages of fish and invertebrate species. Mercury can bioaccumulate in the upper levels of the food chain, affecting larger fish, birds and mammals. Pathogens can adversely affect fish either acutely (lethality) or chronically (histopathological effects, impaired reproduction). Solids can increase turbidity in water bodies, reducing photosynthesis and available food for fish. Solids can also cause siltation of water bodies, burying and ruining spawning gravels that are essential fish reproduction habitat. Nutrient loading can lead to direct or indirect (abnormal algae blooms) depletion of dissolved oxygen in water bodies, which can suffocate aquatic organisms, and lead to observable fish kills. Nutrient limitations may at times limit food availability to aquatic species.

Recreation

The Delta supports about 12 million public user days a year through a variety of recreational opportunities including fishing, camping, and boating. 120 marinas, shown in Figure E-2, are located within the Delta's boundary and approximately 82,000 boaters utilize the Delta's

waterways. Recreational beneficial uses in the Delta may be affected due to pathogens, metals, pesticides, solids, or nutrients. Microbial pathogens can adversely affect the health of those who are participating in water contact recreation, such as swimming, water skiing, or windsurfing. Pathogen contamination of fish or shellfish can adversely affect public health. Certain metals and pesticides, such as mercury and DDT, bioaccumulate in the food chain and can adversely affect recreational fishers who consume contaminated fish and shellfish. Solids loading can increase the turbidity of waters and interfere with the aesthetic enjoyment of these natural resources and constitute a hazard to swimmers. Solids loading is also a mechanism by which pathogens, metals, pesticides, and nutrients are transported into waters that support recreational beneficial uses. Nutrient loading can promote algal blooms that reduce water clarity and sometimes cause unsightly, odorous floating mats and fouling of boat hulls.

Industrial

The Delta supports a wide variety of industries from sugar production to oil refineries. Industrial water is diverted directly from the Delta or conveyed through the same facilities used for municipal purposes. Some industrial processes divert water from municipal systems prior to treatment and treat the raw water to the level required for their specific industrial process. Industrial uses of water may be impaired due to salinity, phosphates, ammonia and pH. Salinity has adversely affected industrial processes such as paper manufacturing through corrosion and mineral scaling of industrial equipment. For refineries, a major user of industrial water, high concentrations of phosphates can aggravate scaling concerns in cooling water systems and high levels of ammonia can cause cracking in brass cooling heat exchangers.

Prioritizing Problem Areas

Defining what constitutes a "problem" is a controversial and debatable issue. Very few of the parameters of concern have been studied sufficiently to understand their fate, transport and impact on beneficial uses of water. If a parameter is measured against an existing objective, criteria or standard a decision must be made 1) whether the standard is appropriate, 2) what the standard is meant to protect, and 3) what level of exceedance is relevant (e.g., duration, season, geographic location, etc.). For example, an exceedance of copper in the Upper Sacramento River during the fall-run chinook salmon juvenile outmigration period might be devastating to the population however, during other times of the year (when fall-run are not present) there may be virtually no biological impact. For some parameters such as temperature and salinity extensive data has been collected. For other parameters such as pesticides minimal information is known. Given the inherent difficulties in attempting to measure data against published standards the Water Quality Program has adopted the following approach to identifying and prioritizing beneficial use problem areas.

- For environmental and recreational beneficial uses, problem areas are primarily designated based on Section 303(d) of the Clean Water Act. This Act requires each state to develop a list, known as a 303(d) list, of water bodies that are impaired with respect to water quality and to identify the sources of impairment (e.g., mine drainage, agricultural drainage, urban and industrial runoff, and municipal and industrial wastewater discharges). Water bodies impaired by

CALFED water quality parameters of concern are shown in Figure E-3.

- For drinking water beneficial uses, problem areas are determined based on the suitability of Delta drinking water sources to be treatable, at reasonable cost, to meet current and future federal and State health-based drinking water standards.
- For agricultural beneficial uses, problem areas are determined according to the impact of irrigation source water on sustainable productivity of agricultural lands.
- In addition a problem area can be defined based on scientific studies and data that indicate a potentially significant problem exists.

Identifying Sources of Problems

To effectively take action to improve water quality conditions it is not sufficient to only know where a problem exists in a water body, the source of the water quality problem must also be identified. Sources of water quality parameters of concern in the Delta and its tributaries include:

- acidic drainage from inactive and abandoned mines that introduce metals such as cadmium, copper, zinc, and mercury;
- stormwater inflows and urban runoff that may contribute metals, selenium, turbidity, pathogens, organic carbon, nutrients, pesticides, petroleum and other chemical residues;
- municipal and industrial discharges that may contribute salts, metals, trace elements, nutrients, pathogens, chemical residues, oil and grease, and turbidity;
- agricultural tail water, or return flows, that may contribute salts, nutrients, pesticide residues, pathogens, and turbidity; and,
- subsurface agricultural drainage that may contribute salts, selenium and other trace elements, nutrients, and pesticides (some fungicides).

Developing Action Strategies

Action strategies have been developed to address water quality parameters of concern in the Delta and its tributaries. The strategies are recommended actions that will result in improvements to source water quality by reducing source loadings of parameters (e.g., mine drainage, agricultural drainage, urban and industrial runoff, and municipal and industrial wastewater treatment facilities); upgrading water treatment plants; or changing water management practices.

Action strategies to address water quality parameters of concern include a combination of research, pilot studies and full-scale actions. For some parameters, such as mercury, there is inadequate understanding about its sources, the bioavailability of the various sources, and the load reductions needed to reduce fish tissue concentrations to levels acceptable for human consumption. For this parameter further study is recommended before full-scale actions are taken. For other parameters, such as selenium, sources are better documented, and source control or treatment actions can be taken with a reasonable expectation of positive environmental results.

Performance targets have been established to measure the effectiveness of actions to improve water quality. Performance targets may be quantifiable reductions in loadings of parameters. For example, the target for copper in the Sacramento River is to reduce copper loadings in the Upper Sacramento River from 65,000 pounds to 10,000 pounds per year. For actions that recommend further study of a parameter the performance target may be a focussed outcome. For example, an action for mercury is further research to better understand the sources and mechanisms of mercury accumulation in the Delta estuary. The performance target is a targeted action plan that specifies selection and prioritization of the most effective mercury remediation actions.

Indicators of success are generally numerical or narrative water quality targets, or biological indicators, that have been developed for each parameter of concern. Targets relate to in-stream, sediment, or tissue concentrations of parameters. They will be used to gauge action and alternative effectiveness at protecting beneficial uses. Targets are based on Water Quality Control Plans (Basin Plans) of the Bay Area and Central Valley Regional Water Quality Control Boards or U.S. Environmental Protection Agency ambient water quality objectives (when available), standard agricultural water quality objectives, and target source drinking water quality ranges as defined by technical experts. Some parameters, such as pathogens have no regulatory objectives. In these cases indicators of success are generally a quantifiable reduction in counts before and after action is taken.

Comprehensively Conducting Monitoring, Assessment and Research

The Water Quality Program, and indeed all CALFED activities, must be based on the application of rigorous science. While there is some information on the existence of water quality problems in the CALFED solution area, much is yet to be learned. CALFED is developing a Comprehensive Monitoring, Assessment, and Research Program (CMARP) to address the need for adequate scientific support not only in the water quality area, but also for the system integrity, ecosystem restoration, and water supply reliability resource areas. The CMARP is central to the CALFED philosophy of adaptive management. The water quality component of the CMARP will provide for:

- Establishing a quality assurance/quality control plan to assure the scientific validity of CALFED data collection included in this plan will be recommendations for standardized data collections and handling practices to assure that all data collected for CALFED are compatible;

- Establishing the actual existence and severity of water quality problems, including evaluating the ecosystem effects of water quality parameters;

- Establishing baseline water quality conditions against which the effectiveness of CALFED actions will be measured; and,

- Evaluating the effectiveness of CALFED water quality improvement actions and identifying the need for adaptive management actions.

Water Use Efficiency Program

The Water Use Efficiency Program reflects California's well accepted public policy, that places a strong emphasis on efficient use of developed water supplies. CALFED believes that existing supplies must be used efficiently before undertaking costly efforts to develop additional supplies or improve the ability to convey water across the Delta.

The greatest current challenge in water use efficiency is finding ways to encourage more water users and water suppliers to implement proven cost-effective efficiency measures that are being used successfully by their peers throughout the state.

The term efficiency may be defined in different ways. Increases in physical efficiency and increases in the achievement of CALFED objectives through improved water management would be direct results of the water use efficiency program. Increasing economic efficiency -- which might result in a reallocation of water -- is not a specific objective of the Program but would likely be an indirect result.

The CALFED water use efficiency program differs from other components of proposed Bay-Delta solution alternatives in two fundamental ways: it is concerned with policy, not technical issues, and most actions would be implemented by local agencies rather than CALFED agencies.

Implementation objectives were established in order to guide the development of approaches for water use efficiency. These objectives are intended to reflect and protect the various stakeholder interests regarding local water use management and efficiency. The objectives were used during program development to test whether a draft approach was satisfactory. There are general objectives as well as specific objectives for urban water conservation and agricultural water use efficiency. General objectives include:

- Ensure a strong water use efficiency component in the Bay-Delta solution.
- Emphasize incentive based actions over regulatory actions.
- Preserve local flexibility.
- Remove disincentives and barriers to efficient water use.
- Offer greater help in the planning and financing of local water use management and efficiency improvements.

Objectives that relate to urban water use efficiency improvements include:

- Incorporate the strengths and benefits of the California Urban Water Conservation Council (CUWCC) and the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU).
- Provide assurance that a high "floor" level of conservation implementation would occur.

Objectives that relate solely to agricultural local water use management and efficiency improvements include:

- Build on the progress and achievements of the *Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California* (AB 3616).
- Provide adequate assurance that agricultural water supplies would be used at highly efficient levels.
- Improve local water use management to achieve multiple benefits.

The CALFED solution alternatives must provide assurance that appropriate water management planning is carried out by local agencies and that cost-effective efficiency measures are implemented. Demonstration of appropriate planning and implementation would be necessary prerequisites for an agency to be eligible to:

- receive any "new" water made available by a Bay-Delta solution,
- participate in a water transfer that requires approval by any CALFED agency or use of facilities operated by any CALFED agency, and
- receive water through the DWR Drought Water Bank. (This is already a policy of DWR.)

The Water Use Efficiency Program includes five main areas.

- **Agricultural Water Use Efficiency** - The agricultural approach recognizes a clear standard for voluntary agricultural water management planning and a balanced process for recognition of adequate programs of planning and implementation. The approach is supported by planning and technical assistance, financing assistance, and proposed assurances.

- **Urban Water Conservation** - The urban approach recognizes a clear standard for implementation of cost-effective conservation measures and responsibility to carry out local water management planning. The approach establishes a process for recognition of adequate planning efforts and recommends a balanced process for recognition of adequate conservation implementation. The approach is supported by planning and technical assistance, financing assistance, and proposed assurances.
- **Efficient Use of Environmental Diversions** - In addition to the broad categories of urban and agricultural water needs, there are important water use efficiency issues related to use of environmental water supplies. Policies related to efficient use of environmental diversions are being examined in the context of the water use efficiency program. Three CALFED agencies are working with other organizations to develop an Interagency Coordinated Program for optimum water use planning for wetlands of the Central Valley. This program would identify Best Management Practices for refuge water management and would develop a water use management planning process for refuge and wetland areas of the Valley. The Interagency Coordinated Program would work closely with, and coordinate with, CALFED to assure consistency of policy, meet the general implementation objectives for water use efficiency, and propose mechanisms that

assure the efficient use of water on refuges, wildlife areas, and managed wetlands.

- **Water Recycling** - The recycling approach establishes a process for recognition of water recycling planning. The approach could include water recycling planning and implementation, technical and planning assistance, funding assistance, and identification of regional water recycling opportunities. This approach will be developed in coordination with appropriate CALFED agencies and consultation with stakeholders and the public, including the Water Use Efficiency Work Group.

- **Water Transfers** - This approach (which is in progress) will be developed in coordination with appropriate CALFED agencies and consultation with stakeholders and the public, including the Water Use Efficiency Work Group.

One of the main objectives of the Water Use Efficiency Program is to maintain local flexibility in the implementation of cost-effective efficiency actions. For this reason, each of the approaches include only policy level actions and do not attempt to identify technical actions. It is the intention that the program provides the nexus for local water suppliers and water users to implement the appropriate technical actions.

Local water suppliers and water users have a large array of technical actions to evaluate and implement. These actions are included in the approach by reference to the following:

- The *Memorandum of Understanding Regarding Water Conservation in California* which lists 16 Best Management Practices (BMPs) to be analyzed and, if cost-effective, implemented by local agencies.
- The *Urban Water Management Planning Act* (California Water Code 10610 et. seq.) .
- The *Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California* which includes several Efficient Water Management Practices (EWMPs) to be analyzed and, if cost-effective, implemented by local agencies.

In addition, technical and planning assistance programs would provide access to numerous other technical actions, especially for consideration at the on-farm level. CALFED Program support would also foster collaboration between water suppliers to analyze technical actions from a basin-wide perspective.

Though unknown as to the actual outcome of local water use management and efficiency improvements, it is assumed that the component would result in significant changes from existing conditions. The extent to which such changes occur independent of the CALFED Program, is not known either, for efficiency improvements would continue to occur regardless of the Program. However, the Program would facilitate greater levels of implementation than would otherwise be expected to occur. The following is anticipated as a result of both current trends and the added influence of the CALFED Program:

- Implementation of urban BMPs could result in a 10-20% reduction in total municipal and industrial demand. Water saved would most likely be used to improve the reliability of existing water supplies and to offset future demands.

- Implementation of agricultural EWMPs could result in real water savings from the reduction of losses. This could be 1-3% of the total demand. This water would be available for reallocation to other beneficial uses, whether in the same district or another, for other agricultural users, for urban demand, or to meet environmental needs. Reallocation of saved water would most likely occur through water transfer markets.

- Implementation of agricultural EWMPs could also result in 8-12% reductions in current applied water demands. These reductions do not, however, necessarily constitute a source of water that can be reallocated to other beneficial uses. Rather, applied water reductions can provide water quality benefits, allow changes in the timing of reservoir releases, and reduce entrainment impacts associated with diversions.

- Increased implementation of urban recycling projects, both local and regional, could provide 1-2 million acre-feet of reusable supply. For local projects, water recycled would most likely be used to improve supply reliability or offset future demands. Regional projects may allow the reallocation of reusable water to other beneficial uses, including agriculture and the environment. These reallocations may or may not make use of water transfer markets.

- Changes in water use management at wetlands areas and refuges would not generate water to be reallocated to other uses. Rather, management changes could provide opportunities to modify the timing of wetland dewatering to correspond to water quality needs, or changes could result in reductions in applied water, with benefits similar to that of agriculture.

Levee System Integrity Program

Introduction

Historically, the levee system has been viewed as a means of protecting other Delta resources. However, levees are an integral part of the Delta landscape and are key to preserving the Delta's physical characteristics and processes. A goal for the program is to integrate their role in defining the waterways and islands with long-term ecosystem restoration of the Bay-Delta system.

Given the numerous public benefits protected by Delta levees, the focus of the Delta Levee System Integrity Program is to supplement and improve Delta levee maintenance and emergency management practices. Developing a mechanism to ensure long-term availability of funding to implement the Delta Levee System Integrity Program and equitable distribution of the costs is an important component of the Finance and Assurances Implementation Strategy for the overall CALFED Bay-Delta Program

The focus of the Delta Levee System Integrity Program is to provide long-term protection for multiple Delta resources by maintaining and improving the integrity of the Delta levee system. In addition, this program aims to integrate ecosystem restoration and Delta conveyance actions with levee improvement activities. Improvements in the reliability of water quality will be a natural by product of this program.

Implementation Strategy

The general approach for the Delta Levee System Integrity Program will be built upon a foundation of existing state, federal, and local agency programs. The focus of this program is to supplement and improve these existing programs where deficiencies are identified, and enhance opportunities to integrate ecosystem restoration with efforts to preserve and improve system integrity.

In most cases, system integrity problems are well understood and the actions needed to improve conditions are clear. In other cases, additional research is needed before potential solutions can be developed. Improvement of Delta levees and channels will require years of evaluation and coordination. For example, subsidence of Delta islands is well understood, but measures to slow or reverse the process are still being developed. Implementing this program will require reliable, long-term funding which distributes the costs of assuring long-term levee system integrity among all beneficiaries.

Ecosystem restoration and conveyance improvements will be integrated with levee improvements to protect existing Delta physical characteristics and processes. This integration will provide opportunities to address multiple problems in the Delta and to coordinate with other program actions.

Full implementation of this program will meet Public Law 84-99 (PL-99) performance criteria for project and non-project levees in the Delta. Over several decades, a phased process will

coordinate potential improvement actions with ecosystem restoration and conveyance improvements. For example, actions to control subsidence can be implemented in conjunction with ecosystem restoration activities and provide an opportunity to continue investigation for reversing subsidence. Habitat improvements, such as creating corridors or Delta channel conveyance improvements, can provide opportunities for improvements for flood control. A comprehensive emergency management plan will be implemented to address protection and recovery of Delta resources in coordination with maintenance and improvement measures.

Program Elements

The specific elements of the Delta Levee System Integrity Program include:

- Delta Levee Base Level Protection Plan
- Delta Levee Special Improvement Projects
- Delta Island Subsidence Control Plan
- Delta Levee Emergency Management Plan
- Delta Levee Seismic Risk Assessment

Delta Levee Base Level Protection Plan
This plan will build upon existing programs and activities to meet minimum federal flood control project levee performance criteria for project and non-project levees in the Delta. Historically, local reclamation districts have been responsible for maintaining and improving Delta levees and have provided the primary source of resources through assessments imposed on local property owners. In the past the federal government has provided some resources for maintenance of federal flood control projects. The state increased its participation when it established the Delta Levee Maintenance Subvention Program and the Special Flood Control Project Program to address maintenance and improvement projects for certain areas of the Delta. Future funding for the Delta Levee System Integrity Program will be included as part of the overall financing strategy for the CALFED Bay-Delta Program.

- **Delta Levee Special Improvement Projects**
  These projects will provide increased flood protection beyond the Delta Levee Base Level Protection Plan for Delta islands which have many public benefits. The state increased its role in Delta levee flood control improvements when it established the Special Flood Control Project Program. Delta islands that protect water quality, agricultural production, life and personal property, cultural resources, recreation, the ecosystem, and local and statewide infrastructure, will be ranked separately for each of these resources.

- **Delta Island Subsidence Control Plan**
  This plan will promote island subsidence reduction to provide long-term reliability of Delta levees through coordination with existing program and activities. The state increased its role in subsidence investigations when it established the Special Flood Control Project Program.

- **Delta Levee Emergency Management Plan**
  This plan will build upon existing emergency management activities to protect critical Delta

resources in the event of a disaster. The existing emergency management structure is designed to coordinate activities of multiple state, federal, and local agencies with varying responsibilities to provide emergency assistance in the event of a disaster.

- **Delta Levee Seismic Risk Assessment**
  This assessment will identify and increase the understanding of the risk to Delta resources during catastrophic seismic events and develop recommendations to improve the stability of Delta levees. To define further the relative risk of catastrophic events and the performance of Delta levees, the Department of Water Resources' Seismic Investigation may be continued. This investigation consists of installing strong-motion accelerometers at three to four levee sites in the Delta; creating a geologic model for deeper soil deposits; ongoing field and laboratory testing to better determine the static and dynamic properties of organic soils; field and laboratory testing to better determine liquefaction potential; and investigation of the potential activity of the Coast Range-Sierra/Nevada Boundary Zone.

Program staff will work with stakeholders, the public, and state and federal agencies, to identify existing programs, potential deficiencies within existing programs, and specific actions for each element of the program to address any identified deficiencies. These actions will be closely integrated with the Ecosystem Restoration Program Plan and Delta conveyance actions to simultaneously increase system integrity, increase ecosystem quality, and protect water quality and water supply reliability.